1. Transmission Data for Policy Analysis

Introduction

Federal law and implementing regulations are causing the most significant change in the U.S. electric power industry since the Great Depression. For more than 60 years the industry was characterized by a structure—utilities serving exclusive franchises—and a regulatory strategy—pricing at average prudent cost of service—that are changing in fundamental ways.

Beginning with the Public Utility Regulatory Policies Act of 1978 (PURPA), and continuing with the Energy Policy Act of 1992 (EPACT), Congress allowed certain kinds of generators to enter wholesale power markets. In 1996, the Federal Energy Regulatory Commission (FERC) issued Order 888 requiring:

> *. . . all public utilities that own, control or operate facilities used for transmitting electric energy in interstate commerce to have on file open access non-discriminatory transmission tariffs that contain minimum terms and conditions of non-discriminatory service . . . .*[7]

The order "unbundled" electrical energy generation from transmission and other services needed to deliver power to customers.[8]

FERC's intent was that its own administrative determination of the cost of service would eventually be replaced by competitive markets as the arbiter of just and reasonable rates for wholesale energy and any services that could be supplied competitively. As FERC explained, Order 888 is necessary because:

> *The only way to effectuate competitive markets and remedy discrimination is through readily available, non-discriminatory transmission access.*[9]

[7]Federal Energy Regulatory Commission, "Recovery of Stranded Costs by Public Utilities and Transmitting Utilities," Order No. 888, Final Rule (April 24, 1996), Summary.

[8]Order 888 also identified a number of ancillary services that were considered, from a regulatory point of view, to be part of transmission service and thus subject to regulatory oversight and the potential for market pricing. These ancillary services include voltage regulation, operating reserves, and balancing energy. A companion order, Order 889, required transmission providers to post their available transmission capacity (ATC) on Internet sites called the Open Access Same-Time Information System (OASIS).

[9]Federal Energy Regulatory Commission, "Promoting Wholesale Competition Through Open Access Non-discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities," Order No. 888-A, Docket Nos. RM95-8-001 and RM94-7-002 (March 4, 1997), p. 11.

Transmission, however, would remain regulated.[10] An exception is that the rates charged by "merchant" transmission projects would not be regulated.[11] FERC's efforts to bring competition to the electric power industry are collectively referred to as restructuring. In response to Order 888 and other FERC initiatives, the industry has seen a huge increase in the number of independent generators seeking transmission services.

Recently the Department of Energy (DOE), FERC, and the Congress have questioned whether the high-voltage transmission system can support its growing economic role.[12] In May 2001, the National Energy Policy Development (NEPD) Group, referring to the transmission system as the "highway system for interstate commerce in electricity," recommended that reliability standards be made mandatory, in part because of the increasingly competitive nature of the electricity market.[13]

In May 2002, DOE's National Transmission Grid Study called attention to the physical capability of the transmission infrastructure by finding:

> *There is growing evidence that the U.S. transmission system is in urgent need of modernization. The system has become congested because growth in electricity demand and investment in new generation facilities have not been matched by investment in new transmission facilities . . . .*[14]

Similarly, in July 2002 FERC called attention both to transmission infrastructure and markets in concluding:

> *[There are] . . . persistent and costly problems in the nation's wholesale electric power markets. These include a decade of under-investment in needed transmission, generation siting in locations far from customers, unduly discriminatory behavior by transmission providers…and fundamental design flaws in certain existing electricity markets . . . .*[15]

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[10]The high-voltage transmission grid is almost universally viewed as a natural monopoly. Without a grid operator to balance power supply and demand at all times, maintain voltage, and ensure that lines are not overloaded, the grid could not operate. The operator accomplishes this by such means as requiring generators to adjust their output to protect the system, opening and closing circuits, and limiting net imports. The grid operator, therefore, has enormous influence over the availability and price of transmission. This power is neither tempered by competition from other networks nor influenced by the threat that most users might leave the grid. Consequently, transmission is regulated virtually everywhere.

[11]A merchant transmission firm directly charges users of its lines for their use. It does not recover its fixed costs through regulated rates.

[12]In 2002 the high-voltage electrical grid consisted of more than 157,000 miles of high-voltage (230 kV and above) power lines connecting generators to bulk power consumers (North American Electric Reliability Council, *Reliability Assessment 2002-2011*, October 2002, Table 3, p. 22). At times government and industry define high-voltage lines as starting at 69 or 138 kV. Bulk power customers include large industrial and commercial facilities, governments, cooperatives, traders, and distribution companies that buy power at wholesale. Distribution companies supply mostly retail customers at low voltage.

[13]U.S. Department of Energy, National Energy Policy Development Group, *Reliable, Affordable, and Environmentally Sound Energy for America's Future* (Washington, DC, May 2001).

[14]U.S. Department of Energy, *National Transmission Grid Study* (Washington, DC, May 2002), p. xi.

[15]Federal Energy Regulatory Commission, "Commission Proposes New Foundation for Bulk Power Markets With Clear, Standardized Rules and Vigilant Oversight," News Release (July 31, 2002), Docket No. RM01-12-000.

Less well recognized is the impact of the industry's structural change on the data supporting public policy. When there is a fundamental change in the way an industry does business, as is now happening in electricity, the basic data needed to describe the industry must also change. Federal agencies charged with collecting industry data must modify their data collection methods and, as needed, acquire new kinds of data. The Agencies must also develop new ways of aggregating and disaggregating basic reports to accommodate new organizational and market boundaries.

The Federal Energy Administration Act of 1974 (PL. 93-275, 15 U.S.C. 761 et seq.) and the DOE Organization Act (P.L. 95-91, 42 U.S.C. 7101 et seq.) require the Energy Information Administration (EIA) to carry out a centralized, comprehensive, and unified energy information program to collect, evaluate, assemble, analyze, and disseminate information on energy resource reserves, production, demand, technology, and related economic and statistical information for use in assessing the adequacy of energy resources to meet near-term and longer term domestic demands and to inform public policymakers. FERC is responsible for regulating the wholesale power market and the high-voltage transmission system that supports interstate trade. Together, EIA and FERC are the major Federal Government sources of transmission information.

The changing structure of the industry and the Federal Government's increasing interest in transmission persuaded EIA to reexamine its official data collections to determine whether they continue to meet the needs of the Government.

Purpose of This Report

One purpose of this report is to examine the suitability of existing official data for informing Federal policymakers about electric power transmission in interstate commerce. Official data are those produced by the Federal and State governments, their agents and regulated entities such as Independent System Operators (ISOs). Data that are **routinely** supplied to DOE, EIA, and FERC by the North American Electric Reliability Council (NERC) are also included.

A second purpose of this report is to determine whether needed, but currently unavailable, data could in fact be obtained. Before any agency of the Federal Government can collect or continue to collect data from 10 or more persons, it must obtain approval from the Office of Management and Budget (OMB). Two minimum thresholds for OMB approval of an agency's data collection are that: the data are needed for the Federal Government's legitimate purposes, and the data can in fact be obtained. Those thresholds are the focus of this report.

Regarding the first OMB threshold, the Federal Government needs data and models to answer factual questions basic to resolving long-standing public policy issues. This report identifies transmission information relevant to three broad national policy interests:

- Reliability and national security
- Economic regulation

- Economic growth and efficiency.[16]

The data examined in this report are those needed to address factual questions of policy interest including the following:

- How reliable is the grid? Is reliability improving or deteriorating?
- How much does transmission cost? What are the revenues, prices, and returns of transmission? How do costs, prices, and returns compare regionally?
- What investments are being made to expand, maintain, and modernize the grid?
- Is the grid accommodating economic trade? Is the grid available to all competitors (i.e., is there open access)? How much do customers and generators pay for transmission? What is the quality of transmission service?
- Are markets for wholesale electricity competitive? Is the grid being used to shield firms from competition?

Regarding the second threshold, this report indicates that currently unmet data needs might be satisfied by one of three means: by modifying existing data collections, by coordinating and consolidating information from official and quasi-official entities, or by undertaking new data collections. It shows that, in principle, the needed data can be obtained; the suggestions do not represent the only or necessarily the best ways of obtaining transmission data.

Any significant change in official transmission data would require long-term coordinated effort across EIA, FERC, DOE and OMB. In reviewing any specific proposal, OMB would consider more than the policy relevance of the data and whether it could be collected. OMB would also consider public comments, whether the data are available elsewhere, the likely quality of the data, the cost of collection, the burden on the public, and whether the data should be confidential. Those issues are not considered in this report.[17]

Finally, this report does not compare official data on transmission collected by the U.S. Federal Government with official data collections in other countries.

Transmission Data and Industry Restructuring

The Federal Government collects a great deal of information about transmission, much of which is predicated on an industrial structure that no longer exists. Many gaps in

[16]The East Coast blackout of 1965 and subsequent blackouts in the Western United States, the terrorist attacks of September 11, 2001, and the August 14, 2003, East Coast blackout showed the national interest in a reliable, secure transmission grid. The Federal Government's substantial involvement in regulating and in building interstate power transmission and generation goes back to the start of the New Deal. The Federal Power Act of 1935 authorized the Federal Power Commission, now the Federal Energy Regulatory Commission, to regulate utilities involved in interstate transmission and power sales to ensure "just and reasonable" electricity prices. In 1933, the Federal Government chartered the Tennessee Valley Authority to build hydroelectric facilities to promote regional economic development.
[17]The availability and quality of privately collected data vary over time, depending to some extent on what official sources choose to collect and release. Data quality, costs, burden, confidentiality, and similar attributes can only be evaluated relative to a specific collection proposal at a particular time.

transmission data discussed in this report have come about because FERC's restructuring initiatives are changing the structure of the electric power industry.

For the limited purposes of this report, the basic elements of a restructured market are as follows:

- Energy, reserves, transmission and various services are unbundled and separately priced. Transmission is to be a standalone enterprise.
- The grid and wholesale markets are open to competitors.
- Markets are used to price wholesale energy and, when possible, related services.
- Transmission tariffs are regional and are based on regional capital recovery and operating costs.
- Additional charges associated with using fully loaded lines, i.e., congestion charges, are signals for transmission use, generator siting, and grid expansion. FERC prefers to price congestion using market prices.[18]
- Grid expansion projects are based on regional plans.

The scope and pace of restructuring have been uneven across the United States. Currently, industry participants are in one of three distinct economic and regulatory systems:

- ISOs in the Northeast and California are operating restructured public markets under formal agreements with FERC.
- In Texas, public power cooperatives and municipal systems continue to operate outside FERC jurisdiction in most respects. Texas has its own market.
- The remainder of the industry is operating in FERC-regulated, private markets that have not been restructured.

In much of the country electricity is unbundled, the grid is at least partially open to competitors, and markets are being used to price wholesale energy. Except for the Midwest ISO, the ISOs have auction markets with publicly reported wholesale market prices. The majority of the country, however, depends on bilateral agreements made in private markets, and wholesale prices are not public. In most of the country transmission rates are not regional, congestion is not separately charged, and regional planning is limited.

Findings

Official data collections were designed in the context of electricity markets based on cost of service, dominated by utilities that served exclusive franchises. Relative to generation, transmission was cheap. Utilities built whatever transmission they needed to serve their customers, and few relied on power from distant suppliers to meet their customers' needs. In that world, transmission was not and important aspect of power markets.

[18]Congestion costs and revenues and system redispatch costs all arise from limits on the transmission grid. They are discussed in Chapter 5, Sections 2 and 3.

With restructuring, some utilities have divested generation; and all are seeing power flows across utility and regional boundaries in response to commercial opportunities. That, together with the entry of independent generators supplying local and distant markets, means that reliability is increasingly dependent on building and managing transmission.

Data collections that the Federal Government relies on to monitor reliability have not kept pace with the ascendancy of transmission in a restructuring industry. The Government does not have the electrical models (power flow models) necessary to verify that transmission capacity is adequate to keep the lights on. The industry's reported plans are not necessarily those imperfectly analyzed in the power flow analyses that industry does submit to FERC. Data for monitoring investments in the high-voltage grid, including those to improve grid control, and indicators of reliability trends are not routinely available to the Government. Neither the industry nor the Government has data adequate to allow rigorous cost-benefit analyses of transmission-related investments to enhance reliability.

Fortunately, much improvement in the Government's capability to oversee reliability could be achieved by modifying existing data collections. FERC collects capital and operating cost data from investor-owned utilities (IOUs) to ensure " just and reasonable" electricity prices. EIA complements the FERC collections with less detailed reports from the other generation and transmission owners to produce industry-wide totals. FERC's Commissioners are concerned with the economics of transmission as a standalone enterprise because of their obligation to ensure just and reasonable prices in a restructuring environment. But FERC's financial accounts are more appropriate to the circumstances of integrated regulated utilities selling bundled electricity in a cost of service environment.

Apart from a few "transmission only" entities, the FERC Form 1 says little about the economics of transmission. Official data do not capture transmission's financial performance, in large part because most transmission revenue is bundled with revenue from retail sales and is not separately identifiable. The available data describing transmission operation costs, capital stock, and investment are not comparable across reporters, because the FERC 1 does not impose a common definition separating transmission from distribution.

If transmission were fully unbundled, its revenues would be unambiguous. Absent that, FERC could require line-of-business reporting—a fundamental change that would be tantamount to introducing a new data collection form. How useful or valid the resulting estimates would be is a serious question. Far less dramatic changes to the FERC 1 would make the data more useful for cost and investment (but not financial) analysis.

Much of the data needed to evaluate the grid's support of markets is already being collected. EIA collects comprehensive data on generators, including those planning to connect to the grid. Those data are indispensable for analyzing the potential supply of

electricity and the entry of generators to the market, and for calculating market shares. The OASIS contains data critical to evaluating access, transmission tariffs, and the quality of service. NERC has data on power flows across the high-voltage grid and on curtailments of transmission service. The ISOs are reporting congestion.

The data are not, however, available for policy analyses. The OASIS data are scattered across dozens of web sites, are neither edited nor archived, and are not in useable form. NERC's power flow and curtailment data are not routinely available for use by the Government in monitoring wholesale trade. Consolidating, editing, and archiving in a single database all the data that are required to be on individual OASIS sites would substantially improve the Government's ability to evaluate the progress of restructuring.

Data on wholesale trade flows and corresponding wholesale prices are not available, and significant research and effort would be required in order to collect the information. The ISOs have all the data needed to assess competition within their areas, but outside the ISOs the Government does not have the data necessary to monitor and evaluate the competitive status of wholesale markets. Government can subpoena data in response to clear behavioral evidence of anticompetitive behavior or as part of a merger approval, but the subpoena is not a reasonable means of obtaining data for ongoing market monitoring.

If Federal regulators and antitrust officials are satisfied with market share analyses, then the critical need is for high quality power flow models to delineate market boundaries. That could be accomplished with power flow models developed for evaluating industry's reliability plans. If Federal regulators and anti-trust officials require analyses of cost-price ratios (Lerner indices) for non-ISO areas, much more than the currently available data would be needed.

Report Organization

This report is organized in six chapters, including this introduction. Chapter 2 enumerates and describes current Federal transmission data collection and indicates some of the data elements available from NERC and the ISOs. The other chapters review information that can be used for describing and analyzing transmission as it relates to reliability, regulation, and economic growth.

Chapter 3 begins by noting that the Federal Government's role in reliability management has been to monitor outages and require IOUs to show that their plans are consistent with reliable operations. The Government requires data to identify reliability trends and emerging problems. The complexity of electricity transmission's role in reliability means that electrical models are necessary to interpret the reliability consequences of trends revealed in the data and of changes in the grid's configuration. Because data series alone can say very little about reliability, policy analysis and formulation are complicated.

The Federal Government, through FERC, will continue to regulate interstate transmission and wholesale prices for the foreseeable future. Chapter 4 focuses on the impact of unbundling on the usefulness of existing financial data collections. Industry unbundling

has not been accompanied by unbundling of financial records, all but precluding financial analysis of transmission entities.

As mentioned earlier, open access to transmission is key to FERC's policies to bring competition to the wholesale power industry. Chapter 5 reviews the data available for assessing the grid's support of open, more competitive markets. Data are relevant to answering questions such as: Are suppliers able to access and connect to the grid? Are the costs and quality of transmission service nondiscriminatory and reasonable? Is power readily flowing from low price to high price areas? Are FERC's policy initiatives succeeding?

The available data are only evidence that the grid is (or is not) being used in ways that are more (or less) consistent with expanding markets and competition. They are not absolute measures of the size of markets or the trade possibilities the grid defines.

Chapter 6 considers the data available for assessing competition in wholesale markets. The Federal Government is responsible for enforcing anti-trust law as well as wire fraud and conspiracy statutes that typically are violated in cases of market manipulation. In the context of FERC's standardized transmission tariff, competitive prices are critical to congestion pricing. If wholesale prices are not competitive, then the economic appeal of using locational prices to manage and pay for congestion is diminished, and transmission expansion decisions may be distorted. The ISOs have substantial information for assessing wholesale competition; outside the ISOs there is little available in the way of useful data.